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ABSTRACT

The audio teleconference summarized in this report joined six state education agencies (Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, and Texas) and the National Institute of Education with experts nationally and abroad for 3 days in April 1984. Presentations summarized include (1) "The Need to Consider Alternative Delivery," Paul Resta and William Kirby; (2) "Learning by Distance: How Effective?" Joseph Lipson; (3) "College Credit for the Gifted by Teleconference," Jan Kruh; (4) "Science Teacher Inservice by Teleconference," Jack Gerlovich and Roy Unruh; (5) "Coursework for Certification of Vocational Education Teachers," Arnold Freitag and Howard Hammond; (6) "Elementary Math and Foreign Languages by Gemini Blackboard," Frederic Todd, Sr., Betty Scott, and Everett Gillette; (7) "Mathematics and Language Drill by Dial Access," Elliot Duchon and Ron Fortune; (8) "Computer Networking for the Classroom," Paul Nachtigal and Richard Phillips; (9) "Computer Chronicles," Margaret Riel; (10) "Improving Reading with Teletype," Clarice Kenney; (11) "How to Use the Gemini Blackboard," Linda Yetter; (12) "Cost Efficiency of Distance Technologies," Leslie Wagner and Rickiann Bronstein; and (13) "Electronic Networks," Carl Oldsen. Summaries are also provided for three sessions on educational policy issues: an interactive problem-solving session, state education agency reports, and a nationwide distance learning survey. Statements by Terrel Bell and Manuel Justiz on the future, a distance learning experience report, and resource information are included. (LMM)

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REGIONAL FORUM ON DISTANCE LEARNING

A REPORT

April 4, 5, 6, 1984

Bridget O'Connor, Reporter

Cynthia Levinson, Editor

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Though based in the Division of Education Information Services, the Regional Forum on Distance Learning was the product of many organizations and many talented individuals. In addition to Southwest Educational Development Laboratory (SEDL), the sponsoring organizations were the State Departments of Education of Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma and Texas, and the National Institute of Education. But for their support, contributions and participation, the Forum would not have been the success that it was. As Forum Coordinator, Cynthia Levinson relied for direction and sustenance on Martha Smith. As Division Director, Martha relied on Cynthia for organizing and orchestrating the Forum.

As is common in an undertaking the magnitude of a three-day international teleconference, it is impossible to acknowledge the significant contributions of everyone. Above all, however, SEDL gratefully thanks AT&T Information Systems for the loan of equipment and the provision of technical support; the consultants, who are listed at the end of this report, for their exemplary presentations; the indefatigable Site Directors -- Dianne Williams, Sue Wilson, Clyde Hatten, Susan Brown, Jack Craddock, Marj Wightman and Dick Lallmang -- at the six state departments of education in the SEDL region and the National Institute of Education; the hard-working members of the Division; -- Diane Downing, Patricia Duttweiler, Linda Lloyd, Barbara Riordan and Claire Waring; and, Bridget O'Connor for making sense of the many strands of the Forum. It is because of their work that, in the words of the evaluator, "it is evident that the Forum accomplished its goals."

Martha Smith
Cynthia Levinson

PREFACE

Conducted entirely by audio teleconference, the Regional Forum on Distance Learning joined six state education agencies and the National Institute of Education with experts nationally and abroad on April 4, 5, and 6, 1984. The agenda, consultant and session information, and hand-outs were distributed in a participant's notebook before the Forum along ith three papers on instructional effectiveness, regulatory and policy issues and a 50-state survey.

This report on the Regional Forum on Distance Learning has a two-fold purpose. First, it is to provide a summary of the presentations of recognized experts in distance learning -- experts in both theory and practice. Second, the report is to serve as a reference guide to educators and administrators who have a desire to develop and/or implement distance learning techniques in their classrooms, school districts, or regions. In an effort to address both objectives, the report is divided into seven sections:

Part I. **"Introductory Sessions"** summarizes opening remarks and addresses major educational management issues raised by distance learning.

Part II. **"Current Practices"** is a summary of actual experiences in distance learning as cited by Forum presenters. Generally, each session consisted of an oral presentation followed by a question and answer period. For reporting purposes, it was sometimes appropriate to present verbatim the questions and at other times to summarize them.

Part III. **"Cost Considerations"** summarizes the presentations of three consultants who spoke on determining the efficiency of distance

technologies, on specifying the costs of audio teleconferencing, and on the providers and costs of electronic networks.

Part IV. "Educational Policy Issues" encompasses three aspects of policy issues that be as educators consider the use of telecommunications in teaching. These are: (1) the responses of a panel of recognized experts to questions posed by Martha Smith; (2) "State Reports" by members of the region's state departments of education; and, (3) a summary of a nationwide summary on distance learning by Diane Downing.

Part V. "The Future," is a verbatim report of addresses by Terrel Bell, Secretary of Education, and Manuel Justiz, Director, National Institute of Education, as well as a summary of the concluding session of the Forum.

Part VI. "Report on an Experience in Distance Learning" is the reporter's viewpoint of the experience as well as the summary of an independent evaluation conducted by David Gillmore, Evaluation Consultant.

Part VII. "Resource Information" provides readers of this Report with the names of and relevant contact information for the Forum's consultant and other participating experts in distance learning. These include members of the cooperating institutions, assisting individuals, and the staff of the Southwest Educational Development Laboratory that planned the Forum.

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REGIONAL FORUM ON DISTANCE LEARNING

AGENDA-AT-A-GLANCE

CENTRAL STANDARD TIME

CENTRAL STANDARD TIME

	April 4	April 5	April 6
9:00	FORUM INTRODUCTION OVERVIEW: THE NEED TO CONSIDER ALTERNATIVE DELIVERY P. Resta/W. Kirby Host: C. Levinson +*	COLLEGE CREDIT FOR THE GIFTED BY TELECONFERENCE J. Kruh *o	PROBLEMS IN THE USE OF DISTANCE LEARNING TECHNOLOGIES: TALK TO THE EXPERTS
9:15			
9:30			
9:45			
10:00		SCIENCE TEACHER INSERVICE BY TELECONFERENCE J. Gerlovich/R. Unruh +*o	N. Hudson/M. Goldstein/ L. Bransford/M. Payer/ F. McCormick +*
10:15			
10:30	LEARNING BY DISTANCE: HOW EFFECTIVE? J. Lipson +*		
10:45			
11:00		COURSEWORK FOR CERTIFICATION OF VOCATIONAL EDUCATION TEACHERS A. Freitag/H. Hammond +*o	STATE REPORTS: USES OF TECHNOLOGY IN SUPPORT OF INSTRUCTION Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, Texas
11:15			
11:30			
11:45			
12:00	ELECTRONIC NETWORKS C. Oldsen +o	ELEMENTARY MATH AND FOREIGN LANGUAGES BY GEMINI BLACKBOARD F. Todd/B. Scott *o	FIFTY-STATE SURVEY D. Downing, SEDL +*o
12:15			
12:30			
12:45			
1:00		MATHEMATICS AND LANGUAGE DRILL BY DIAL ACCESS E. Duchon/R. Fortune *o	
1:15			
1:30			
1:45	COST EFFICIENCY OF DISTANCE TECHNOLOGIES R. Bronstein/ L. Wagner *		THE FUTURE Terrel H. Bell Manuel Justiz Host: Leonard De Layo Close: Preston Kronkosky +*o
2:00			
2:15		COMPUTER NETWORKING FOR THE CLASSROOM P. Nachtigal/ R. Phillips +o	
2:30			
2:45			
3:00		"COMPUTER CHRONICLES" M. Riel *o	
3:15			
3:30			
3:45			
4:00	HOW TO USE THE GEMINI BLACKBOARD (Tentative) AT&T +*o	IMPROVING READING WITH TELETYPE C. Kenney *o	
4:15			
4:30			
4:45			
5:00			

* Instruction Interest Area
\+ Policy/Management Interest Area
o Supporting Uses of Technology Interest Area

PART I. INTRODUCTORY SESSIONS

"Welcome"

Southwest Educational Development Laboratory

Martha Smith, Division Director, welcomed the conference participants to the Forum and then introduced Cynthia Levinson of SEDL, the Conference Coordinator. Ms. Levinson in her opening remarks explained that the Forum had four major objectives:

* to provide information from both researchers and practitioners about the costs and current uses of distance learning in K-12 education;

* to provide resource information about experts, practitioners and vendors;

* to address instructional policy questions arising from the use of distance technologies in teaching and learning;

* to provide an experience in distance learning for educators.

"Overview: The Need to Consider Alternative Delivery"

Paul Resta

As Chief of Research, Planning and Technology in the Office of the Director of the National Institute of Education (NIE), Dr. Paul Resta opened the Regional Forum on Distance Learning. He briefly reviewed the substantial support that NIE has provided in the application of telecommunications to education, including research and development for the Alaskan satellite system. The Institute has supported activity in Appalachia as well and is keenly interested in the vast possibilities of telecommunications for educational benefit.

Currently, NIE is building an internal structure to link the Institute with the laboratories, centers and ERIC Clearinghouses and is bridging capabilities with national and state educational networks. An example of the latter is the support that NIE is providing to the Council of Chief State School Officers for its Project of State Leadership and Technology.

Dr. Resta pointed out that distance learning is not a new concept. In fact, he has been committed to applying such techniques to teacher training and inservice since working with southwestern Native American tribes in New Mexico on bringing programs off-campus to reservations. He found the programs exciting and cost-effective.

In addressing the themes of the Forum -- instructional effectiveness, policy and management issues, and supporting uses of technology -- Dr. Resta emphasized that instructional quality is paramount. Technology is no substitute for good teaching. The policy questions have significance at local, state and federal levels as well as implications for NIE's research agenda. He closed by saying of the Forum, "The medium is virtually as important as the message."

William Kirby

In his presentation on the incentives that state education agencies have for seriously considering distance education, Dr. William Kirby, Commissioner for Finance and Program Administration at the Texas Education Agency (TEA), emphasized that we must be more "future-oriented" in education.

Among the problems encouraging a look to future solutions in Texas are (1) increased graduation requirements, (2) remoteness of student populations, (3) teacher shortage, and (4) financial problems. Dr. Kirby

substantiated these difficulties by pointing to House Bill 246 which increases the credits required for graduation from 18 to either 21 or 22, depending on the level chosen by the student. The Bill further requires fine arts and foreign language courses. However, almost one-half (490) of the school districts in Texas enroll fewer than 500 students. "We have a real concern how some of these small, isolated school districts are going to be able to provide that equal access, those curricular opportunities" that suburban and urban schools can.

The problem is compounded by the fact that the state suffers a shortage of from 3000 - 4500 fully certified teachers each year. In regard to the fine arts and foreign language requirements, the 490 smallest schools have attracted only 18 (of the 1615) foreign language teachers and only 76 (of the 4600) fine arts teachers.

Finally, the Agency has computed that it will cost $20 billion to provide education as it is provided today to the estimated 4.5 million children in the state in 2000. In response, TEA is encouraging both a "weighted pupil approach" to financing and the provision of instruction by distance technologies.

In response to a question about delivering fine arts courses to remote schools, Dr. Kirby suggested the use of satellite beamed from a central location to television sets or video cassettes; he reiterated that TEA knows the problems but is only at the beginning in their resolutions. Another Forum participant asked about the practice of schools' hiring teachers to teach a course if 10 students are interested. Dr. Kirby said that such practices exacerbate teacher shortage problems, and he emphasized a more flexible approach. After all, "to offer a course, you don't have to hire a teacher."

"Learning by Distance: How Effective?"

Joseph Lipson

Joseph Lipson, Group Director of WICAT Systems, reported on the effectiveness of the use of technology in distance learning. Lipson's theme was that students can and do learn through technology if the human factors of learning are incorporated into the design of the learning experience. In short, a successful learning experience requires educators to consider a combination of factors: (1) the cost effectiveness of the technology; (2) the type of material to be presented; (3) the psychological barriers to understanding; (4) the methods of instruction; and (5) the effectiveness of methods for promoting student concentration and persistence.

Lipson explained that research on correspondence courses shows that students who complete the course do as well as students in the traditional classroom. Lipson pointed out, however, that only about 30% of the correspondence school students ever complete the course. In an effort to improve the completion rate, one school provided broadcast television programs. Access to this additional medium doubled the completion rates. The well-produced television programs provided an emotional and psychological climate otherwise not available. Citing further success stories in increasing completion rates, Lipson described programs in Florida and Missouri in which the instructor or an aide telephoned the student every two weeks. Once this personal contact was established, completion rates of the courses reached 80-90%. These success stories demonstrates that students can learn by distance.

In explaining these successes, Lipson stated that most students cannot learn without some emotional support that helps them choose to study when

study is competing with other appealing activities. Therefore, a social network that defines and reinforces what is expected of them is very important. This network can be phone calls, notes from the instructor, activities with classmates, student public performances, certificates of accomplishment, etc.

Following his research presentation, Dr. Lipson answered questions from Forum participants. Following is an edited version of those questions.

Q. Is there a difference between high school and college students in regard to correspondence course completion rates?

A. I do not believe there need be. In fact, high schools can assemble students in a group more easily than can colleges; therefore, high school completion rates should compare favorably with college rates.

Q. In regard to the high school dropout rate, has anyone done an investigation to ascertain why students were doing the course in the first place? What was their motivation in beginning the course?

A. The studies I have seen applied to beginning post-high school students such as housewives. They took courses such as vocational preparation (e.g., accounting) as a means of self improvement, to develop a talent (e.g., oil painting), etc. Regarding completion, a questionnaire designed and sent out by the University of Mid-America turned up an interesting fact: Researchers discovered that if the student was willing to answer and return the questionnaire, he/she was more likely to complete the course! The real reason for persistence in the course appeared to lie in the psyche of the person taking the course.

Q. What special training does an instructor need in using technology?

A. The instructor should, of course, be comfortable with the technology. Also, the instructor needs to be aware of the students' emotional

needs and design the course as a "complete" experience, keeping in mind the intended outcomes and the course content. In other words, the instructor needs appropriate materials over which he/she has command.

In addition, appropriate assignments are critical, and must be well planned. Once the student has completed an assignment, the instructor must be trained to react to the student's work. In a sense the instructor's reactions repays the student for his/her effort. Grades and comments on homework are extremely important for providing emotional support in a distance learning environment.

If an instructor is to be video taped or audio taped, she/he must be trained for effective presentation.

Q. What impact do instructional materials have on learning outcomes?

A. Instructional materials have an important effect on the persistence and quality of learning. Program materials should be aesthetically appealing to attract and hold the student's attention. They should guide and focus the student's effort. Explanations should be systematically developed and tested so that the isolated student has a good chance of understanding a lesson even when there is no one to anwer questions. The medium used and the approach taken can have an important effect on what students learn. In addition, the student should have a specific place where he/she regularly completes the assignments without distractions.

Q. What impact does the individual teacher have on learning outcomes?

A. Studies show that if the instructor is charismatic and personable, the student is more likely to want to learn.

Q. What research corroborates your premise regarding presentation of learning materials?

A. The following is an example of how the mode of presentation affects learning. A recent research study was performed in which students were read a story; others watched the story on television. Both groups were asked to re-tell the story to the researcher. Those who watched the television version used little of their past experiences in relating the story. Those who had the story read to them so that they only heard words and did not see pictures used personal past experiences in their narratives. This suggests that the information supplied by the medium affects the way that students organize information.

Q. What is the optimum group size?

A. From my reading and observation no single optimum size exists. Sometimes a student needs to work alone; sometimes a small group promotes a rich learning dialogue; sometimes a large group provides a proper setting. In small groups, we should be careful that one student does not dominate the process. In large groups, a charismatic teacher is desirable.

Q. We are in an information society; does the plethora of information technology just add to our problems?

A. You have a good point. Herbert Simon of Carnegie-Mellon University once said that we are drowning in information. The problem is sorting it out. Once we are overloaded by information, we need to have a mental model of our subject of interest to help us know what to pay attention to. By the way, new technology does not usually diminish the use of old methods; we use a technology when it serves a particular purpose, when it is effective.

Q. What can we do to facilitate group interaction?

A. As an example, we can establish self-help groups where students working together, in turn, take 20-30 minutes explaining the concepts to other students. Also, even when using a medium like TV, we can create more interaction. One instructor told students that after watching a play they had to call him up and give the answer to a few questions. He set his tape recorder to accept the calls and record the students. The instructor then listened to the tapes and dictated comments that were sent to the students on tape. It made for a lively exchange. A computer network and bulletin board is another mechanism for stimulating group interaction if students are given specific assignments in which they must use the bulletin board.

PART II. CURRENT PRACTICES

The Forum provided examples of specific applications of distance learning concepts and the costs of their use. Reported experiences in the use of teleconferencing, dial access, electronic blackboards, audio cassettes, computers, and teletype machines showed how distance learning experiences aid in the instruction of courses for which enrollment is too low to justify an on-site teacher, courses for which qualified teachers are not available, or courses which are enhanced by the use of a distance technology. The distance learning techniques described sometimes provide the entire learning experience; other times the techniques supplement existing courses, providing additional, more timely skill development or additional scope or depth into a subject. In addition, the reported applications illustrated the use of distance learning concepts at elementary school, high school, college, and post-graduate (that is, teacher inservice) levels.

"College Credit for the Gifted by Teleconference"

Jan Kruh

Jan Kruh, Director of the Kansas State University Regents' Continuing Education Network, described the Network (TELENET) which provides instruction (1) as a two-hour college credit course for gifted high school students; (2) as a free supplement ("Mini Series") to high school students; and (3) as a Continuing Education Program.

(1) College Credit Program. For a ten-week period, Kansas State University professors or other prominent experts or authors provide a

series of eleven two-hour teleconference sessions. One hour is reserved for lectures; one hour is reserved for student questions and discussions. Thirty-six permanently installed TELENET locations and up to twelve additional schools serve as instructional sites. The program focuses on providing services to rural schools. The student registers for the course by phone and pays tuition. To receive two credits, the student submits a comprehensive referenced paper which Kansas State professors grade, evaluate and return to the students.

In determining the topics for these sessions, the Teleconference Advisory Board engages in extensive planning with high school teachers. Topics of past series include "Radiation and People," "Eminent Authors," and "The 1984 Election Year: Choices and Challenges."

Once the topic is chosen (approximately nine months in advance of the series) the Division of Continuing Education prepares the course -- arranging for speakers, preparing the student handbook, and working with the school coordinator in establishing procedures and schedules. During the spring before the fall program the Division sends a flyer describing the program to the high schools so that local administrators can schedule classes accordingly.

(2) High School Supplement Program. In addition to the "for-credit" option, a "Mini Series," such as "The 1984 Election Year: Choices and Challenges," "Women's Studies," and "Genetics," is regularly offered to interested students, at no charge.

(3) Continuing Education Program. TELENET also serves the Continuing Education needs of 2500 adults, three-quarters of whom are graduate students in teaching and nursing, by offering twelve courses per semester weekday evenings and Saturday mornings. In the summer, courses -- again,

by teleconference -- are offered for teachers during both day and evening hours. Student evaluations of the course, on a 5-point scale, have an average of 4+.

An estimate for the cost of an eleven-program series follows:

One month's work from professor	$2,500
Materials to be sent out, postage	600
Honorarium per speaker	400
Brochure postage and printing	1,500
Leasing networks 22 hrs @ $170/hr	3,740
Total	$8,740

This program is subsidized by the Department of Continuing Education and the Department of Arts and Sciences. Ms. Kruh justified the expenses explaining that this total represented a figure much less than the costs schools would have in hiring renowned teachers for the gifted. Moreover, the success and effectiveness of the courses made them "worth every bit of expenditure and effort."

"Science Teacher Inservice by Teleconference"

Jack Gerlovich and Ray Unruh

Jack Gerlovich, consultant in Science Education, and Roy Unruh, Associate Professor at the University of Northern Iowa, in "Science Teacher Inservice by Teleconference," described the Physics Resources and Instructional Strategies of Motivating Students (PRISMS) project currently being pilot tested in 52 Iowa schools. Using video discs, computers, and teleconferencing techniques, PRISMS provides inservice content and pedagogy training for physics teachers who have a marginal physics background. Speaking from a hotel in Boston, Gerlovich and Unruh explained the history, concept, and application of PRISMS in Iowa.

Citing a lack of qualified physics teachers, the Iowa Department of Public Instruction and the Legislature donated funds, and the U. S. Department of Education provided a $132,000 grant to probe the use of the telephone, computer, video disc, and other peripheral technologies to provide inservice training to physics teachers who had little access to inservice training.

In their presentation Gerlovich and Unruh explained "learning cycle," the concept on which the project is based. Students are presented with a phenomenon in a laboratory setting, and then each is asked to find scientific relationships. Once the students have attempted to explain the phenomenon, the teacher introduces the concept and provides appropriate application activities.

Pedagogical aid to the instructor is given in a teleconference with six to twelve other physics teachers. The inservice instructor provides the "how-to;" potential laboratory experiments are set up, and the physics teachers themselves learn physics via the same learning cycle which they may later introduce to their classes. Various phases of the learning cycle are aided by computers (tutorials and simulations) and video tapes. Gerlovich and Unruh described one video tape which showed

> where the elastic potential energy of a rubber band is transferred into the kinetic energy of a glider on an air track. Few schools have air tracks so the experiment is recorded on video tape such that the students viewing the tape can take the required data from the tape and do the graphing and analysis.

PRISMS instructors distribute a guide for the physics teacher which serves as a resource tool and provides structure and organization to the course.

It should be noted that a teleconference with participating physics teachers follows the project director's personal contact workshops. This teleconference provides opportunity for physics teachers to interact with

each other and discuss new classroom management techniques. One reported outcome of the project is a camaraderie which develops among the teachers.

The project is currently operating under a U.S. Department of Education grant. The costs are low. According to Gerlovich and Unruh, increasing the number of teachers on line would cost only an estimated $250 - $300 per school. Moreover, providing teacher inservice by telephone costs one-tenth that of face-to-face instruction.

"Coursework for Certification of Vocational Education Teachers"

Arnold Freitag and Howard Hammond

Arnold Freitag, Coordinator in the Department of Industrial Technology at the University of Northern Iowa, and Howard Hammond, consultant in the Iowa Department of Public Instruction, addressed the problem of providing coursework in vocational certification to a small, dispersed population of vocational education teachers. The emphasis of their certification program is on preparation on an inservice basis to become proficient in teaching by completing studies in methods, evaluation, curriculum and foundations. Audio cassettes, the telephone, and personal contact provide a self-paced program leading to certification.

In a question and answer format planned and conducted by the Session Host in conjunction with the consultants, Freitag and Hammond described the University of Northern Iowa's "Operation TECPAK." A summary of the questions, as posed by the Session Host, and the consultants' responses follows.

TECPAK, an acronym for the Teachers Competency Packet, uses open-entry, competency-based individualized instruction presented through a variety of on-line or simulated learning experiences. Six courses are

available: "History and Philosophy of Vocational-Technical Education," "Trade and Technical Course Construction," "Coordination of Part-Time Industrial Education," "Methods of Teaching Trade and Technical Courses," "Special Problems in Career Education," and "Personnel Evaluation in Vocational Technical Education." The instructor contacts the students through three campus conferences, on-site visits, and telephone conversations.

At the first campus conference, the "circuit rider" (the instructor) explains the instructional modules and distributes the audio cassette tapes. The second and third conferences are examination periods. The course is completed when the student masters pre-established competencies and passes exams. The circuit rider visits student sites throughout the semester. Freitag and Hammond attributed the success of the program (a phenomenal 90% completion rate) to the frequent telephone and direct personal contact with the students.

The project is funded by $19,000 of federal funds and $15,000 of institutional funds. Freitag explained the system had proven to be a very cost-effective way of providing the coursework for vocational certification.

"Elementary Math and Foreign Languages by Gemini Blackboard"

Frederick D. Todd, Sr., Betty S. Scott,
and Everette Gillette

Dallas' South Oak Cliff High School offers students an opportunity to enroll in trigonometry, calculus, analysis and foreign language courses which, according to Frederick Todd, Principal, were unavailable in schools where enrollments were too small to justify an assigned teacher. By using the Gemini Blackboard and audio teleconferencing equipment one instructor

conducts classes in three high schools. Each school or "site" has a room set up with teleconference equipment and a Gemini Blackboard. Five to seven students participate per site with a paraprofessional on hand to administer the classroom activities and distribute materials and tests provided by the system manager.

In demonstrating the use of the Gemini Blackboard, Everett Gillette taught a French lesson entirely in French, and Betty Scott demonstrated a "plan of action to conquer word problems in math." The Blackboard is also used at South Oak cliff for social studies and language arts; special services, such as local and national elections; seminars on Black history; staff development for teachers at the three schools; planning among the principals who do not need to travel to a common site; and as a "substitute teacher" when an absent teacher cannot be replaced.

Scott explained that the Gemini was a motivational tool "beyond belief," not a novelty. She described a competitive atmosphere among the three schools in which students worked hard to participate actively in classroom activities. Everyone wanted to speak or use the blackboard.

Todd explained, however, that the success of the program was also a result of good, overall planning. The cooperation of the district's principals to schedule the classes and the great energies and skills of the classroom teacher in preparing for the class were contributing success factors. Todd commented that teachers using these media need both knowledge of the subject matter and an ability to simplify concepts.

Todd explained that a yearly $15,000 grant covers the costs of the rented equipment and the use of the telephone lines for the three schools. When a Forum participant asked the purchase price of the equipment, participants from Washington, D.C. and Oklahoma, quoting an expert from

AT&T who had demonstrated the equipment in a prior session, explained that the Gemini system (the blackboard, not the monitor) costs about $12,000.

The question also arose as to how many sites one teacher could handle in this type of learning situation. Scott responded, "at least seven," because within the scope of the Forum she had been able to conduct a class with seven sites!

"Mathematics and Language Drill by Dial Access"

Elliot Duchon and Ron Fortune

Elliot Duchon, Project Manager of Instructional Computing at the Riverside County Schools, and Ron Fortune of Computer Curriculum Corporation described a novel application of computer assisted instruction to students in the Riverside, California school district. "Dial-a-Drill" uses digital speech over a dial-access telephone and a CCC computer to supplement classroom teaching.

Approximately 450 students spend six to ten minutes each day at home completing self-paced drills in mental arithmetic, spelling, and reading. Using a touch-tone telephone and access codes to the Dial-a-Drill minicomputer, students call the computer and respond to the questions posed by the synthesized voice by keying in answers on their telephones. Printed progress reports are sent regularly to teachers and parents. In mental arithmetic drills, the student completes mathematical problems without the aid of calculators and computers. Spelling lessons concentrate on construction patterns, vowels, word/text analysis, and review. For reading drills, an "off-line text" -- a workbook -- supplements study in vocabulary and reading comprehension.

According to literature describing the system, "Dial-a-Drill" benefits the school and the student as it

- reaches the student away from school; the student may be at home or in a hospital;
- provides computer-assisted instruction to large numbers of students;
- provides regular flexible practice in basic skills through a minimum of 13,000 exercises covering a wide range of grade levels;
- individualizes lessons; Dial-a-Drill provides automatic assessment of student level and continued adjustment based on performance.

The complete system -- the computer, the digital speech, and 12 channels -- costs approximately $15,000 per year. Software for the system is rented at a cost of $100 per channel per year. The price, according to Duchon and Fortune, was quite reasonable when one considers the large number of students who can access the exercises. The system can keep up to 5,000 individual student histories. To offset these costs, some states are now considering a consortium approach to using the system. This sharing is possible because the only geographical limitation to Dial-a-Drill is the cost of the telephone transmission.

"Computer Networking for the Classroom"

Paul Nachtigal and Richard Phillips

As an alternative to school consolidation, McREL (the Mid-contintent Regional Education Laboratory) has proposed a cluster approach to rural school improvement. Using a "cluster" approach, a consortium of neighboring schools design, implement, and evaluate programs which benefit all participants. Paul Nachtigal, Senior Associate of McREL, cited examples in the areas of curriculum development, teacher sharing, advanced class offerings, and even extra-curricular activities.

Paul Nachtigal and Richard Phillips, Division Director at the Missouri Department of Education, described one successful cluster, the Mid-Missouri Small Schools Consortium, and its "Mid-Missouri Small Schools Computer Writing Project."

The Mid-Missouri Small Schools Consortium is a voluntary association of five rural school districts working with the Missouri Department of Elementary and Secondary Education, the University of Missouri, and the Mid-continent Regional Education Laboratory. Enrollment in the participating schools range from 358 to 1157 (K-12) students. One full-time staff person serves the schools, providing training and technical assistance in instructional uses of the computer.

Initiated by McREL, the two-year Mid-Missouri Small Schools Computer Writing Project is funded by $2,000 from each of the participating school districts and $10,000 from the University. In establishing the project, each school district identified a team of six teachers--elementary, junior high, and secondary. These 30 individuals attended a summer writing institute (for credit) which combines the "Bay Area Writing Project" with word processing technology. Teachers then implemented the project in their classrooms, and became Teacher/Consultants to their peers.

Nachtigal and Phillips explained that this project can eliminate some of the major "roadblocks" to learning to write. (1) Students need something to write about; the computer can provided access to data sources. (2) Because the writing process is labor-intensive, students often have difficulty getting words on paper; the computer can speed the process. (3) Writing is not a linear process of outlining, writing and editing. Rather as Nachtigal explained, there is "a lot of backing and forthing" among these processes. The flexibility of the word processor allows the student to accomplish these tasks.

Nachtigal explained that to be successful,

- clusters should be organized where there is a distinct advantage to cooperation and pooled funds;
- have a three-year commitment; time is needed to establish trust and cooperation;
- be arranged among schools similar in size since they experience similar problems;
- receive technical assistance and project leadership from neighboring institutions of higher education and the state education agency;
- be composed of three to seven neighboring schools;
- have a simple organizational and operating structure; for example, meetings should occur only monthly or every six weeks;
- equally share all costs among participating schools with one school agreeing to serve as fiscal agent.

With cluster members sharing resources and ideas among themselves and with other clusters, according to Nachtigal and Phillips, "the approach works!"

"Computer Chronicles"

Margaret Riel

Margaret Riel, Researcher at the University of California at San Diego, described "The Computer Chronicles" project which involves elementary students working interactively with the computer to acquire basic skills in writing.

Using a microcomputer and the software, which provides numerous prompts in both Spanish and English, students compose their own news stories. When finished, they send them to participating schools in California, Alaska and Australia. When the stories are received by the students, an "Editorial Board" of five to ten students reads the articles, evaluates them, and puts them together to form a newspaper at their location, thus sharing news, jokes, weather and interest stories from remote states and countries.

The results of the program have been remarkable:

(1) As measured by pre and post-test findings, students' attitudes toward writing have changed dramatically. In fact, students rated the "Chronicle" as their favorite school activity at the same time they rated language arts as their least favorite school activity. What the students enjoyed most was the interaction with other students at both their own schools and through the network. In fact, students often gave up recess (traditionally their favorite activity) to work on the "Chronicle."

(2) Students' editing skills increased. For example, two of the students who worked on the "Chronicle" project were out of their classroom during English lessons. Their classroom teacher was concerned as these students regularly scored below grade level on school English tests. This teacher was suprised to find, however, that by editing stories written by others, these students learned enough about the rules of grammar to pass the English tests at grade level.

The interactive software and network materials for participating in the "Computer Chronicles News Network" are available from InterLearn Inc., P. O. Box 342, Cardiff by the Sea, California 92007 and cost $69.95. The software is designed to be used with the Writer's Assistant word processing system; communication with the network is possible by use of a "maildisk" of through the Source or Compu-serve.

"Improving Reading with Teletype"

Clarice Kenney

In "Improving Reading With Teletype," Clarice Kenney, Supervisor, Caldwell Parish Elementary Schools, discussed yet another distance learning technology, the teletype machine. Kenney described a program which employs

the use of a continual teletype machine for developing language arts/ reading skills for fourth-, fifth-, and sixth- grade students. Kenney's summary of the program follows.

A regular Associated Press teletype machine (for broadcast) is located in the school and operates 24 hours per day, 7 days per week at a cost of about $3,000 per year. Students in grades four to six edit the reams of material into newspapers, school broadcasts, and a daily radio news program which is broadcast locally. Each student in these grades participates in these activities. A few of the skills the program helps to develop are:

1. Phonetic analysis and pronunciation. The AP material carries a daily phonetic guide which students study diligently (with no nagging or promoting) in order to pronounce words correctly in broadcasts.

2. Summarizing. Students have to shorten long passages into a few sentences in order to cover the entire news scene in a time limit (on radio) or space limit (in newspaper).

3. Finding the main idea. Students reduce whole stories to topics in news briefs and in writing headlines.

4. Vocabulary development. Students look up words in copy that they do not know and substitute a synonym or definition. Words used in news copy have high utility and students are likely to hear the word used again that very day if it is in the news.

5. Oral and written language development. From the beginning students added their own local news coverage from their own sources to these broadcasts and newspapers.

6. Distinguishing fact from opinion. These fourth, fifth and sixth graders have become highly sophisticated in this skill after mistakenly reporting to their peers and on the radio that (1) President Reagan had not

been shot, when in fact, he had; and (2) the plane carrying hostages had left Iran, when in fact it had not. They have learned that "according to sources close to..." does not always indicate a fact, and they have learned to question and research rather than take for fact all printed and broadcast material.

7. Reading charts and graphs. The teletype presents much material in this form such as river stages, hit parade, sports scores, temperature ranges, stock market, etc.

8. Research in all areas of science, health and social studies. Students use material from the teletype to write reports as individuals as well as class projects such as nutrition research and following the space shuttle.

The list of skills is limitless. Teachers have made learning centers, such as math folder games, using such student interests as baseball batting averages, the current top ten hits, etc. Students' self images have improved, and parents take great pride in the program. They love to watch the evening news and read the newspaper to see if they handled the situation as Dan Rather did. This instant feedback is highly motivating. The students absorb a wealth of information, while being given the opportunity to develop into well informed and thinking citizens as well as good readers.

"How to Use the Gemini Blackboard"

Linda Yetter

In order to prepare participants to interact with the session conducted by Dr. Todd of South Oak Cliff, Texas and to make presentations during the "State Reports" session, Linda Yetter, Account Representative at AT&T

Information Systems, demonstrated audiographic conferencing with the Gemini Blackboard.

Ms. Yetter explained the components of the system which include a pressure-sensitive blackboard that detected the movement of chalk along x and y coordinates, a control unit that allows for erasures, and a transmitter/receiver that relays electronic signals through a modem and telephone lines to standard television monitors. Simultaneous voice transmission is conducted via a speaker phone, in this case an AT&T Quorum Terminal.

After explicating the system configuration, the presenter demonstrated its interactive capabilities by drawing a portion of a geometric figure on the board and asking a participant at a distant site to complete the drawing. In addition, several sites played a regional game of tic tac toe. Thereafter, she discussed business and training uses of the Gemini Blackboard for information sharing, problem solving and decisionmaking uses.

PART III. COST CONSIDERATIONS

The theme flowing through all discussion of teleconferencing costs was that the major variable educators should consider is the initial decision to use teleconferencing technology. Courses which can appropriately be taught through a lecture method are prime candidates, although, as Gerlovich and Unruh demonstrated, even "hands-on" laboratory courses can be effectively taught by distance at a reasonable cost.

In addition to the cost information that was shared by practitioners and summarized in Part II, three sessions during the Forum specifically addressed the questions, "How much does it cost? Is it worth it?" The presentations of the consultants who spoke to this issue are summarized below.

"Cost Efficiency of Distance Technologies"

Leslie Wagner

Leslie Wagner, Academic Secretary of the National Advisory Body for Local Authority Higher Education in London, explained that the first cost consideration is ascertaining whether or not distance learning technology is the most appropriate medium for instruction. Technology costs are declining while the costs of the conventional educational delivery system, which is labor-intensive, do not decline; thus over time, technology can actually decrease instruction costs. It should be used, however, only when it helps meet educational objectives.

The second consideration is determining which technology components are most appropriate video technology is "frighteningly" more expensive

than audio alone. Would the educational gain from its use be worth the cost? After choosing the appropriate medium, the educator must select the appropriate software. Choosing software which best transmits the real educational content is vitally important.

In order to help Forum participants ascertain the cost of distance learning, Wagner explained that costs can be measured in three categories: (1) total; (2) average, (3) marginal.

(1) Total cost is that figure needed for the budget.

(2) Average cost is the total cost divided by the number of students.

(3) Marginal cost is the cost associated with adding one more site or one more student to an existing program. While cost figures are necessary, the cost figure itself is meaningless in terms of learning effectiveness. However, the cost figure is often necessary to justify the use of technology.

The difficulty educators face in establishing these figures is that such configurations have not previously been done. Distance learning programs have no "data base." Program designers must design the system first and then determine the costs involved in operating a system whose components are rapidly changing. A problem also exists in ascertaining just how many students will be using the program. Because distance learning may be open access, it is difficult to come up with accurate estimates.

An additional accounting-related problem is that much technology cost is up-front capital-intensive. In calculating the annual costs of services, the cost of the equipment can be amortized. For example, the true annual cost, including that of transmission, of using $100,000 worth of equipment, bought at 10% interest, over a five-year life-time, would be aproximately $40,500. If the cost is amortized over 10 years rather than

five, capital investment can be reduced to $10,300 per year. The problem, therefore, is determining technology's expected life and correctly estimating recurrent charges which always fluctuate from year to year.

Another problem in establishing reliable cost figures is that a large portion of the costs of technology are incurred before anyone in the school district can use the technology. Wagner said that new technology is to education what Henry Ford was to car production. Ford, Wagner explained, invested a lot of money to establish an assembly line in order to make the first car. Distance learning programs are taking the same risk; much capital must be invested before anyone knows the results.

This investment risk points to the second major cost area considered -- social or "people" costs. Wagner reiterated that the best way to approach the use of technology is first to define the task to be accomplished and determine whether technology can (1) save the school money, (2) provide appropriate results, (3) best reach the intended audience, (4) overcome traditional barriers to learning, and (5) provide better instruction than a traditional teacher. Once these considerations have been evaluated and the decision is made to "go ahead," Wagner offers the following recommendations in evaluating fiscal and social costs.

- When there is any doubt in establishing cost figures, the educator should use the accounting technique that supports his or her project. The initial capital purchase decisions are crucial to the success of a project; if those decisions do not reflect long-range planning, the system will not prove cost effective. Therefore, accounting techniques which amortize the project over a lengthy period of time or which consider wide pupil access can legitimately be used.

- In addition to hard numbers, social costs in using distance learning techniques must also be considered. The loss of student interaction with an instructor -- an isolation element -- must also be considered in determining instructional costs. Wagner pointed out, however, that social benefits exist which may offset the isolation element. For example, television instruction could increase the

opportunity for social groups to make learning more accessible. Also, the use of video discs sent to rural schools could provide a learning experience otherwise not available.

"Cost Construction Model for Audio Teleconferencing"

Rickiann Bronstein

Rickiann Bronstein, Instructional Development Consultant at the University of Colorado Health Sciences Center, presented a conceptual model for establishing the costs associated with the implementation of an audio teleconferencing network.

The model is based on three major cost categories:

. Program development, including personnel (faculty and staff),

. Program production,

. Program delivery, including hardware and telephone line charges.

It should be noted that the costs associated with each of these categories will vary considerably depending upon the type of institutional support already in place. For example, production development costs might include fees or honoraria for faculty content expertise in an agency which must contract for all services. In institutions where faculty are already on salary, content expertise may not be an additional cost.

Costs of Program Development. An example budget was presented from a private non-profit educational agency where this item totaled 40 hours @ $20.00 per hour for a five-session course, ($800). The average development time was eight hours for every one hour of teleconference. Included in this category was staff time to create the written materials which were mailed to participants prior to the teleconference. Also included was photography for technical slides, as well as procurement of clinical samples to be sent for analysis by participants in this course on clinical microbiology.

Costs for Program Production. This item deals with the activities required to generate the materials that support the live teleconference. The following items were included in this example budget:

Clerical support	$ 360
Audiovisual reproductions	$ 375
Printing	$ 140
Miscellaneous supplies	$ 150
Total	$1025

Since there were fifteen sites participating in this five-part program, the cost per program for each site was:

$1025/5 = $205 (cost per program)/15 sites = $13.66 per program per site

In this example, the variables which can be most easily manipulated to control costs are the quantity and type of visual pre-program material which is mailed to the participating sites. The duplication costs of 35 mm slides can be quite high if there are a large number of slides per hour of teleconferencing and many sites which must receive a complete set. In an effort to control these costs, we at the University of Colorado now limit the number of slides per hour to twenty.

Costs of Program Delivery. The important consideration in this category is the type of system utilized to link electronically the participating sites and the originating site together in real time. There are three primary ways this can be accomplished: standard telephone services, private meet-me bridging services, and hard-wired permanent telephone networks.

A discussion of the strengths and weaknesses of these systems is beyond the scope of this presentation. However, the costs do vary considerably. For purpose of illustration, the current cost associated with one private bridging service is $18.00 per hour per line. So in a conference

where there are nine sites plus the origination site, the fee would be $180 per hour of live "on line" time. It should be noted that, in our example, the line charges were paid by each site independently, so this figure was not included as a production cost to the agency developing the program.

Summary

When the cost construction approach is used, it should be possible to create a teleconference program where the costs can be accurately projected and can be manipulated if necessary to meet budgetary restrictions.

For an indepth discussion of the concepts presented above, please see the following reference:

TELECONFERENCING - A Practical Guide to Teaching by Telephone. R. Bronstein, J. Gill, and E. Koneman. ASCP Press: Chicago, Ill. 1983. 1-800-621-4142 (toll free number)

" Electronic Networks"

Carl Oldsen

Carl Oldsen, Research Specialist for the National Center for Research in Vocational Education at Ohio State University, described current electronic mail vendors, the systems being used in distance learning and their cost-effectiveness.

After explicating a hand-out matrix that displays the electronic networks he investigated Oldsen identified three vendors as the most cost-effective: (1) Dialcom, (2) Telemail, and (3) MCI Mail. Oldsen recommended Dialcom as it has been in existence the longest and, generally, has provided the best service.

Researchers who compared the costs of the three aforementioned networks, based on a series of messages, found MCI to be the least expensive

network; Dialcom a close second; and Telemail a far third. Oldsen explained that these cost figures were unstable in the light of the recent AT&T divestiture.

Oldsen explained that electronic mail's primary use consisted of bulletin boards or newsletters among school districts. Currently, electronic mail programs are not cost-effective although these computer-based message switching systems have been providing very timely information. The key to such programs' cost effectiveness, Oldsen explained, was the "critical mass" factor; the more sites involved in the network, the lower the cost.

In describing a program sponsored by Ohio State University, Oldsen explained that the first year the network was in existence, a grant covered its costs. After the grant ceased, its level of traffic declined only 25 percent.

Forum participants asked specific questions concerning the use of a electronic mail network:

Q. How many data bases does your system subscribe to and do you foresee a time in the future when only one data base will be needed?

A. We currently subscribe to four data bases. "One" data base would be ideal; the industry appears to be heading that direction now.

Q. Do you have problems with users who have different modems?

A. Fortunately, no; the company has specific lists of compatible technology.

Q. As the cost of writing letters is increasing dramatically, will we see a corresponding increase in electronic mail costs?

A. Perhaps, but the cost of transmitting data may go up at the same time that the equipment costs go down.

Q. Is there a maximum or optimum number of users?

A. No; we hope to get every state department involved.

Q. Who is the network's coordinator?

A. The contact person, the person who receives and sends messages, is the State Director who also serves a good security function.

For further information on Ohio State's Network, one can call (800) 848-4815.

PART IV. EDUCATIONAL POLICY ISSUES

"Problems in the Use of Distance Learning Technologies: Talk to the Experts"

A panel of distance learning experts explored five major issues in the use of technology to support education: (1) teacher certification requirements, (2) applications, (3) teacher training, (4) program management, and (5) design materials. Heather Hudson (telecommunications, research); Michael Goldstein (law); Louis Bransford (instructional materials, research); Mary Payer (technology consulting, research); and Fred McCormick (research, evaluation) provided insights into solutions for specific questions posed by Martha Smith of SEDL.

Problem 1: Teacher Certification Requirements

> Can a rural school district employ an MIT professor of physics to teach advanced physics by distance technology? The MIT professor does not have a state teaching certificate. The teacher uses the state-approved course of study; the student achieves. Should the state department require certification of the MIT professor? Would the course be accredited in the high school? The combined enrollment for the ten districts causes the class size to be 100. Is that a problem? Although the teacher uses the state-approved course of study, he develops additional material for distribution and subsequent interaction. Does that material have to be approved by someone? In fact, he finds the state-adopted textbook not to be current. He recommends the purchase of another textbook and additional library material. Does he have this right?

Bransford: An early satellite demonstration in eight Rocky Mountain states parallels this scenario. A new telecourse was being offered. The problem was one of certification for the television instructor. It was suggested that we identify a teacher of record who was certified and could serve as a

surrogate for the television instructor. Provisional certification was also considered. The question posed, however, may have to do more with reciprocal certification to accommodate distance learning. For this problem, I suggest we look both at provisional certification and at teachers of record as interim solutions.

Goldstein: The idea of having a teacher of record is excellent because it is a solution which relieves the local district of the problem of investigating the credentials of the faculty member who is providing the instruction. To further clarify how this solution fits into the particular scenario described, we can assume the MIT professor, highly qualified to teach the course, has not had the pedagogy courses that would permit him to be certified. Having a "teacher of record" gets around this problem. Another approach to solving this problem would be to have the MIT professor viewed not as another teacher, but as instructional material. Obviously, this solution still requires a teacher of record at the local school district; however, it makes the course an instructional package; the instructor is not separate from the rest of the materials being delivered. This approach would entirely sidestep the question of whether or not the instructor is properly certified.

McCormick: Certification and accreditation guidelines are instituted to provide for minimal instructional requirements, not the maximum. In the case described, rural students were probably selected for an advanced learning experience. In this situation, we have a rationale for the solutions posed by Mr. Bransford and Mr. Goldstein. We must go beyond the minimal requirement and respond to the purpose of instruction to try to service students better. While we do not want to sidestep established certification or accreditation programs, we can actually undergird their requirements with these realistic solutions.

Does the makeup of the student body (students from various locales, schools) pose an instructional problem?

Goldstein: The size of the aggregate class is irrelevant in the same way as the number of students who can use a particular textbook is irrelevant. The limiting factor is the degree to which interaction is desirable; 100 students may be too large a class in some circumstances, and miniscule in other situations. We should avoid looking at aggregate numbers when those numbers really don't have any particular meaning in the context of telecommunications-based instruction.

Philip Gehring in Austin commented: The problem poses some other interesting aspects: with rural schools, it is unlikely that we can have a certified teacher of record teaching advanced physics; having a teacher of record in the classroom seems to undermine some of the cost savings we hope to realize through distance learning.

Goldstein: The question becomes, then, do we need a certified teacher of record in the particular discipline at the particular level. Remember, we are using this learning experience as enhancement, not just a minimal level of instruction. In most jurisdictions, if the teacher is certified at the minimal level, he or she is a science teacher. For example, most states don't certify a teacher as qualified in advanced physics. So, we are really talking about a level of detail that most certification laws don't consider.

Bransford: I interpret the question to mean that the school would have the MIT instructor there and a teacher of record -- a double cost. That would be the case if the instructor of record was assigned full responsibility for the class. In the MIT case, the instructor of record could have other

responsibilities in addition to the monitor role. No cost advantage can exist if you have to maintain a full teacher load and at the same time incur additional cost to import specialists. It appears we need a more concrete definition of "instructor of record."

> If the material which the instructor from MIT is using is not part of a state -adopted textbook, is there an approval process?

Goldstein: The legal short answer is yes...if the state requires advance approval and if the district or state must approve the curriculum. On the other hand, if the course is based upon a state-approved curriculum or book but supplements the material, in most jurisdictions supplementary materials do not require additional approval.

Problem 2: Applications

> The school district has only limited funds for technology use. It therefore is limiting its use to specific populations for special education students of one kind or perhaps disadvantaged migrant students. Is this a sound use of resources?

Payer: Research data on the use of the computer is often confined to looking at different user groups, i.e., advanced students, average students, lower-than-average students, or special needs students. Most research-based studies have shown that for all students, there is an overall academic gain when using the computer. However, another way of looking at the use of computers is to determine the groups of major planning and implementation. Major groups include individual teachers, groups of teachers, teachers and principals, and other administrators. For example, the recent Johns Hopkins study of computer usage in the schools showed that

when there is a single teacher involved with planning and implementation, student use of computers is less efficient than when more teachers or administrators are involved. However, advantaged or advanced students tend to benefit most when only a single teacher is involved. In addition, research showed that the computer was idle for longer amounts of time when single teacher roles were dominant. In short, with limited resources, a rational way of planning might be to look at the actors involved with regard to more efficient time-use spread over all groups of students. In addition, the researchers found that additional benefits to gifted students are not so strong that the practice of favoring this group over other groups would appear justified.

Hudson: It is important to think about specific populations. As phrased, the question doesn't give us enough information. We can't make a judgement about effective use of resources; we need to know more about the priorities and problems of the school district. Because of the unlikelihood that any school district could afford the money for equipment, production, and course development for all academic areas, the school district must be selective. Educators first identify their problem area and then decide whether the use of technology is the best way to enhance and improve the instructional process.

McCormick: Based on work we have done, I certainly agree that effectiveness increases with the involvement of additional teachers.

Problem 3: Teacher Training

> We have heard that successful distance learning programs have standards for their teachers and mediators. Where are teachers and mediators being trained? What are they learning that is different from what other teachers learn?

Payer: What we are finding is that training for the use of older technologies (audio/radio and instructional TV) is often received at the undergraduate level while for computer use (a relatively new idea), most training is received through inservice workshops.

Moreover, when you look at the major use of computers -- drilling and reinforcement -- the impression results that the computer is being most widely used as a reinforcement tool. But, when we look at studies of what would be required in the future for appropriate learning and reasoning strategies, we should be thinking about different approaches to reasoning and about game strategy -- analysis in which the computer is a basic research tool.

McCormick: A project in Trempealeau County, Wisconsin has amounted to a consortium of about seven rural school districts which use distance technology. The area is very hilly; weather and roads can impede travel. As this distance learning project matured, the districts were able to do more in cooperation with the teacher trainer at the university. In addition, technology vendors, such as equipment distributors and producers, were often very good sources of information.

Hudson: In terms of instructional media like radio and television, a lot of effort is usually put into the production side. Not as much effort is made in working with the teacher using the programs; I think this is a mistake. On-the-job training prevails generally. In terms of teleconferencing, the instructors tend too often to be given only a little introductory training -- or short-term training -- and it is not until instructors are actually involved in the course that they realize they ought to know more. It should also be pointed out that such instructors are often not getting compensated in terms of either more salary or relief

from other duties. A teacher needs dedication, time, and effort in learning how to use the technology.

Can anyone on the panel relate a situation in which someone teaching from a central point and the classroom mediators or interveners are operating as a team? Let's say the team consists of one master teacher and then three or four people who are not professionals, not teachers.

McCormick: The project over in Trempealeau County in Wisconsin has evolved to that type of situation.

Payer: Peter Stoll from the Center for Learning Technology in New York told me that in the Appalachia tier in New York State, television is used as an aid to teaching in rural schools in the fashion you have described.

Do you know of any colleges of education which are teaching both about and with distance learning technologies?

Bransford: I have one illustration that partially answers the question. We were recently commissioned by the Annenburg CPB Project to examine the feasibility of slowscan television utilization in education. The study went beyond slowscan television utilization. We wrote to the 58 institutions of higher education with graduate programs in instructional technology. Of the 35 responses, only three institutions indicated that slowscan television was included in coursework. They continue to place major emphasis on full-motion instructional television.

Has anyone found that if courses are presented through the use of technology -- total instruction or primary instruction, not enhancement -- that learning decreases at the college level?

Payer: Kulick and Cowan, examining results of computer-based instruction, found the use of the computer actually raised examination scores of college students by a .25 standard deviation. The researchers also found that computer use had a positive effect on the attitudes of the students toward the subject being studied and the amount of time they spent studying.

Goldstein: There are several very large-scale instructional services in operation. For example, the PBS adult learning service is reaching about 100,000 students a semester. It is hard to distinguish between technology-based learning and classroom-based learning because classroom-based learning is very variable. Technology-based learning is constant from semester to semester, from classroom to classroom. Obviously, that is not the case with individual teachers. A charismatic, brilliant teacher will take a group of students and lead them to great heights, and another teacher with the same curriculum will put the class to sleep.

Kay Allen, Acting Director of the Extension Instruction and Materials Center at the University of Texas at Austin: Researchers in North Carolina compared very strictly defined instructional methods including face-to-face instruction and the use of three distant technologies. They found no significant difference in learning.

Problem 4: Program Management

> Our school district cannot find or afford teachers for advanced math and science courses. Are there schools which are cooperating to do this with whom we can communicate? Have they experienced any management or policy problems different from those experienced in other cooperative arrangements? Were the cooperating schools cooperating in other ways: testing students, purchasing and so forth?

McCormick: Initially, some of the Wisconsin Trempealeau County school districts had equivalent finance and personnel problems. We found that oftentimes cooperative arrangements are put together because of the leadership of an individual and the personality of an individual; sometimes it will be a superintendent who has the trust of neighboring superintendents and who is recognized as a lead person in the area. Respondents said that people might even cooperate in order to avoid school consolidations.

> I talked with a superintendent two weeks ago who was facing a consolidation problem; he was more concerned about the problem that a cooperative would afford him. He told me that the only way he would be willing to be part of a cooperative would be if he could manage the cooperative. He was not sure that having a teacher from another school doing the teaching would be adequate or appropriate for his community. What are other examples of cooperation?

Hudson: While I don't know of an example at the school level, the question of how to share distance learning resources at the university level has been confronted. There was clear recognition that specialized courses could be shared rather than duplicated throughout the University of Texas system. The question of how would we cooperate, who would get credit for having students registered, would we have to list new courses at each particular site -- all were issues.

Goldstein: Texas is a good example of a state that is attempting to move forward and set some standards along these lines. The State Higher Education Agency has just issued a policy paper on financial and operational concerns. The elementary and secondary community will watch those developments.

Payer: The National Diffusion Network, funded by the Department of Education, makes 115 pre-tested programs available nationwide to public and private schools at the elementary, secondary, and adult level. Each state has a facilitator for the diffusion of the particular program desired. This facilitator is in touch with all of the other teachers throughout the country who have used the program. This is a way educators can learn about schools who have experience in managing cooperative projects.

> Is there a lack of national and state level leadership throughout the country in relationship to distance learning technologies?

McCormick: Our general impression from the activities with which we have been involved would be to say "yes." We must help people disseminate information about their successes and failures in using technology; this can be accomplished at national, regional, state and local levels.

Problem 5: Design Materials

> Our schools are ready to use teleconferencing as an instructional medium. What should our state education agency do to prepare administrators and to prepare teachers? Are there instructional design aids for teachers available at elementary and secondary levels?

McCormick: The state agency needs to provide local districts with administrative guidelines for the use of telecommunications-based, distance learning classes. The guidelines should address such problems as: "Will the school district receive the same state payment for students learning via distance technologies as they do for students who are attending class with a regular instructor?" Such questions must be resolved prior to

program development. Administrative and legal questions should be answered at the state level at an early point.

Payer: Wisconsin and Alaska have produced sophisticated instructional design aids. At the onset of a project, instructional design people must include administrators in their planning. Morever, studies show that when administrators are both trained in the use of technology and brought into the process of planning the use of technology, the program is much more successful than if they are not part of the planning stage.

"State Reports: Uses of Technology in Support of Instruction"

This session of the Forum was an audiographic conference which began as each state signed on; Texas Education Agency's Marj Wightman, Director of the Division of Communications Services, drew a map of the region on the Gemini Blackboard; individual sites orally signed on and then graphically signed on by placing a "hello" message to the group on their location on the map. While each state reporter presented his or her report, an individual in another state took notes on the Gemini Blackboard. The reports were presented in alphabetical order, beginning with Arkansas.

Arkansas

Charles Watson, Curriculum Specialist in Mathematics, summarized those activities which relate to specific applications of technology to support Arkansas' instructional programs. The applications were grouped in three main areas: (1) Instructional Television, (2) Computer-Aided Instruction, and (3) Network Projects.

Instructional Television. The Arkansas Educational Network provides state-wide instructional programs and participation materials for recipients. To account for scheduling difficulties, schools can videotape the programs for presentation at later times. In addition to the State Network, two schools have satellite dishes which enable them to receive an even broader instructional program.

Computer-Assisted Instruction. First, Watson discussed Project IMPAC (Instructional Microcomputer Program for Arkansas Classrooms). Jointly funded by the state and private business and industry leaders, IMPAC was created upon the advice of the Arkansas Commission for Computer-Based Education. The primary purpose of IMPAC is to develop a model for the infusion of technology into classroom activities. This first year (1984), math is offered to upper elementary grades (4-6). The twenty-one participating school districts receive computer-assisted instruction; some receive computer-managed instruction as well. A second purpose of the project is to develop a file of CAI software.

A second project discussed was the Interactive Video Cassette and Microcomputer Project administered by the University of Arkansas at Fayetteville and funded jointly by the University and the Winthrop Rockefeller Foundation. Video cassettes provide courses in study skills, trigonometry, and advanced sciences. The microcomputer provides drill and practice exercises. This project is now being used by schools which face teacher shortages or low student enrollment.

Network Projects. Arkansas has a variety of networks available for information transmission to teachers and students. First, Arkansas' televised presentations show a variety of projects available for classroom adoption. The presentations include information about both course

materials and instructional techniques. In addition, CONNECT-ED is a computer network which links schools to a central data base of legislative reports and news stories. Students have access to networks which include dial-access projects enabling them to do practice drills at home.

Louisiana

John Hubbell of the Louisiana State Department of Education Management Information Systems categorized distance learning technologies currently being used in Louisiana as (1) Instructional Television and (2) Computer-Related Projects.

Instructional Television. From the 1980-1981 school year to the 1982-83 school year, the number of televisions used by Louisiana's 1500 public schools doubled. The number of available programs has also increased dramatically. The 1983-84 school year had 100 instructional series; next year, 123 series will be offered. In addition, plans are underway to expand offerings next year for inservice teacher education.

Computer-Related Projects. The State Department of Education Commissioned the Louisiana Computer Literacy Task Force to give direction for the use of computers in the instructional process. On the Task Force's recommendation, the State Department now provides inservice workshops to teachers on the use of computers and provides consultants to individual school districts. In addition, Louisiana participates in the Minnesota Educational Computer Consortium. MECC participation means that schools are able to share ideas and applications of software and get feedback from other schools. In addition, the Career Information Delivery System (CIDS) provides students with a data base on colleges and careers. Louisiana now

keeps tab on the numbers and types of computers being used in schools. In terms of numbers of computers, Tandy ranks first; Apple ranks second.

Mississippi

Clyde Hatten, Coordinator of ECI, Chapter II, explained that as he was collecting data to present to the Forum, he discovered that many distance learning programs had been terminated because of lack of funding. The plans discussed below, which can be categorized according to (1) Instructional Television and (2) Computer-Related Instruction, indicate a blend of what is currently being used with what is being developed for the future.

Instructional Television. This blending is exemplified by Mississippi's use of instructional television (ITV). Eighty-four percent of Mississippi's schools share in the broadcast of 118 instructional TV programs which span every discipline. In addition, through ITV, one can also earn college credit. ITV programmers are currently working with Public Radio which can reach the visually handicapped. Another example of cooperation is between schools and private cable companies; private cable companies are offering free public lines for set-up in local districts.

Computer-Related Instruction. The Mississippi Educational Computer Association (the new MECA) is now offering microcomputer assistance to educators. MECA has a large collection of public domain software which is free to Mississippi educators.

The state universities are also involved in distance learning. The university system has purchased groups of microcomputers which can be sent throughout the state to teach courses where no local teacher is available. A specific example of this application is the Research and Curriculum Unit,

which has ten units for agricultural teachers. The units provide programs for classroom agriculture teachers in areas such as pesticide applications, cost analysis, and farm management.

For students, dial-a-drill is available in many districts. Hatten specifically mentioned drills for shorthand and reading. The Gemini Blackboard is used generally only at the university level and by industry.

New Mexico

New Mexico State Department of Education's Susan Brown, Intradivisional Projects Coordinator, explained that the state is greatly involved in computer education through buying microcomputers and setting up user networks. She explained that recent emphasis has been on the evaluation of software since many schools already have the hardware. Brown described efforts on the state level related to (1) Computer Technology and (2) Instructional Television.

Computer Technology. The New Mexico Computer Users Association, a 600-member group which is 80 percent educators, meets once or twice a year to evaluate software and work together for cooperative buying. A second source of microcomputer support is the Department of Education's Computer Task Force which recently published a computer education guide for all schools. The Task Force publishes information on computer-assisted instruction in a variety of subject areas. A third resource, the State Department's Educational Resource Center, has several microcomputers which the Department's staff uses to review software, and then in turn, to provide technical information to districts on the software value.

Currently, Albuquerque and the Department of Education are developing a proposal to establish a clearinghouse for educational software.

Instructional Television. New Mexico has a consortium of over 50 districts which purchase television programming. In addition, Brown described TECHNET and EDCON which, though in their infancy, may prove to be exemplary telecommunications programs. TECHNET is a network composed of the University of New Mexico, New Mexico State, New Mexico Mining and Technology, the Sandia Labs, Los Alamos Labs and other industries which will allow the universities and industries to share programming and telecommunication services. Brown anticipates that EDCON will be established by next year and will provide for the interconnection of the other universities, post-secondary schools and community colleges in the state.

Oklahoma

James Ondrejka, Microcomputer Programmer Technician, explained that while he had no information available on instructional television, he was able to provide the Forum with information concerning Oklahoma's use of microcomputers in education.

Computer-Related Instruction. In 1982, following Minnesota's lead, Oklahoma's State Department of Education attempted to coordinate the efforts of introducing microcomputers into the schools by creating the Instructional Computer Resources Section. Originally, the Section's plan was to establish five modems to be linked to the five most frequently used microcomputer systems in an effort to disseminate computer information and programs. A secondary purpose was for educators to be able to tap into numerous networks, particularly INUNET. However, financial problems (in

particular, a zero dollar budget) curtailed many of the distance learning activities.

In 1982, at the beginning of the Instructional Computer Resource Section's project, Oklahoma had 1400 computers; currently, 4,000 are in the classroom. Ondrejka pointed out that Oklahoma is not on a state purchasing contract. Therefore, the State Department cannot recommend one computer brand or a particular software package. As a result, eleven different brands of computers are in the schools (with Radio Shack and Apple the most prevalent). Software availability is also a problem. Commercial software is hard to preview and often does not serve its intended purpose. Ondrejka described public domain software as "junk;" therefore, the state is attempting to produce its own software.

A corresponding problem is school districts' inability to use computers. Cited were instances known where computers had sat in the school unused for more than a year. Therefore, another purpose of the State Department's Resource Section is to train teachers to use the equipment on an inservice basis.

In describing further measures to promote the use of technology, Ondrejka explained that the State Department is currently participating in AIT's (Agency for Instructional Television) computer project. "Solutions Unlimited," a result of the project, is a consortium of forty states and twenty-four instructional software programs for three major brands of microcomputers.

Texas

Texas Education Agency Education Specialist Keith Mitchell described Texas' distance learning project in three categories: (1) Inservice Teacher Training; (2) Software Support; and (3) Instructional Television.

Inservice Teacher Training. Mitchell explained that Texas has recently revised curriculum requirements in all content areas. Two computer-related requirements have been created, effective September 1983: (1) a half-year computer literacy course for the seventh- or eighth- grade level, and (2) at the secondary level, a choice of transcript routes, labeled general and advanced. Currently, Texas' twenty Regional Service Centers are developing a training system for teachers of the newly created computer literacy course based on a Texas Education Agency-developed list of suggested competencies both for teachers in general and for teachers of computer literacy. The advanced transcript route requires one year in computing. Current courses which count for this year are business and vocational data processing and programming, or computer math. In an effort to offer students preparation for college-level computer science, a two year sequence in computer science will be added to the curriculum modeled after the advanced placement course in computer science.

Software support. The Texas Education Computing Cooperative (TECC), a cooperative effort of the twenty service centers, has developed a software evaluation network and data base, a state-level negotiated reduced rate for the use of the Guidance Information System, and the development of a computerized Learner-Based Accountability System. Each of Texas' 20 regional centers has a microcomputer and modem and subscription to Bibliographic Retrieval Systems' database.

To better understand what the State Board of Education's role in software support should be, a software symposium is planned for May 1984 in which publishers, school personnel, hardware vendors, and software venders will be involved.

Instructional Television. Mitchell explained that most large cities in Texas have or are implementing integrated systems of ITFS, cable TV, and tape lending services. Houston's INTERACT system, a 50-watt ITFS interactive-instructional television network, went on-air September 1, 1984. The system offers one-way video and two-way audio on four channels. Transmissions originate from the Region IV Education Service Center. Schools receive up to four classes per hour. Similarly, the Dallas and Austin Independent School Districts are implementing two-way cable TV to each of their schools allowing one-way video and two-way voice and data transmissions. Other schools are using PBS educational programming to enhance instruction.

The State Board of Education has an Advisory Committee on Information Technology and Telecommunications. The Committee is examining the satellite systems integrated with other technologies for the delivery of instruction to schools with teacher shortage problems.

Mitchell further explained that numerous professional education associations in Texas use electronic bulletin boards, electronic conferencing, and electronic mail to promote information sharing. For example, TECC recently implemented an electronic bulletin board on which teachers may access information on instructional computing. Eighteen content specialists from various disciplines update the bulletin board with resources for information, a calendar of events, and state and local news on educational computing.

Following the state reports, participants had an opportunity to question each other.

Q. Mississippi (to New Mexico): How are you getting software at a reduced price?

A. New Mexico: Several districts have formed a consortium, the New Mexico Computer Educators Association, which has mechanisms for buying software. There are other consortia among school districts, and they form contracts with distributors and developers of software.

Q. New Mexico: We want to know what other states are doing to certify teachers in computer education.

A. Arkansas: We have chosen not to get into that arena. What has to be done is work with teachers on an inservice basis -- or work with universities on preservice training. Too often, we stifle new programs with stringent or unrealistics requirements for teacher certification. We have to be careful not to do that here.

A. Texas: We are looking at two different areas here. Texas does have certificates for computer science but not for computer literacy. We are talking about giving a small test out of one office to teachers for approval; training will be done by the regional service centers.

A. Mississippi: A 12-hour "add-on certificate" has been proposed for high school teachers.

A. Oklahoma: Teachers of computer science in Oklahoma must hold a certificate in science, math or business and have taken 6 hours of computer science courses.

Q. Oklahoma: What major brands of computers do you use? Do you have legal rights to recommend a particular brand? Is there a mass buying agreement?

A. Louisiana: Three major brands -- IBM, Apple, and Radio Shack. These three brands are on state contract; agencies can go out for bids. In

addition, the state is working with computer companies to allow teachers and administrators to go into computer shops with a letter certifying their employment so they can buy a computer for personal use with the state discount.

Q. Louisiana: Can Texas give us some of the bulletin board numbers that they use?

A. Texas: At this point you have to be a subscriber to what is called the "The Electric Pages" in Austin. If you would like to try that number you can call my office and I can give you a temporary password. My phone number is 512/475-2478. If you would like a copy of what is on the bulletin board, you can write the Texas Education Agency, 201 E. 11th Street, Austin, Texas 78701.

Q. Oklahoma (to Texas): How did you get your TCEA bulletin together?

A. Texas: "The Electric Pages" is a commercial company that provides the database we work with and the technical information. We contacted 18 specialists who volunteer to keep it updated. Mitchell is the editor.

Q. Oklahoma: We would like more information on interactive video at the University of Arkansas.

A. Arkansas: Contact Dr. George Marsh or Dr. Mary Jo Pride at the University of Arkansas. It is still being piloted but I believe they are very interested in expanding it to other areas. Their address is College of Education, Graduate Education Building, University of Arkansas, Fayetteville, Arkansas 72701.

Q. Oklahoma: Public Domain Software -- and the New MECA. Is Mississippi's software truly public domain? and who is participating?

A. Mississippi: What we have is a combination of software. Some of the software is good; some of it is teacher record-keeping type of

information. The bulk is Apple; but we have added to it with software written by teachers in the state.

A. Louisiana: Most of Louisiana's public domain software is not very good, and what we have is not totally evaluated. We are perfectly willing to share our public domain software with everyone in the region. We do have some good things from Texas that Texas collected from all over the country.

A. Arkansas: You're in for a long seige if you're going to develop courseware on your own. It's commendable, but some good commercial software that is integrated with courses in the classroom is coming out.

"Report on Survey on Uses of Distance Learning"

Diane E. Downing

Diane E. Downing, Dissemination Specialist at SEDL, presented the findings of a nationwide mail and telephone survey she conducted during December - January 1983-84 to determine the extent to which the 50 states currently use distance learning techniques. Twenty-eight state departments of education (56%) completed the survey. Half of the responding states indicated that no distance learning projects exist in their states; the remaining fourteen, however, showed a wide range of present activities and future plans. Following is Dr. Downing's "Capsule Summary" of the "Survey on Uses of Distance Learning.

1. Resources or assistance provided by the state department of education: By and large, state departments of education are taking a major leadership role in the planning, implementation, and funding of distance learning projects. Where states provide no direct funding, they still may serve as consultants, brokers, or organizers.

2. Funding sources for distance learning projects: States generally do not use school financing formula funding for distance education, relying instead on separate services funding or, in some cases, on federal funding.

3. School districts using telephone, video, or computer telecommunications: Hundreds, perhaps thousands, of school districts are using some form of telecommunications for distance learning, but most state departments of education are not yet systematically collecting data in these areas.

4. Teacher training and teacher certification: Few states have teacher training for distance learning; nor has teacher certification been affected. Some states have, however, begun to surface and examine the topic.

5. Types of courses delivered by distance learning: The range of courses is broad, covering the full spectrum of content and grade levels.

6. Full or partial courses delivered by distance learning: Typically, courses delivered by distance learning are motivational or supplemental (adjunct) in nature rather than full courses (mainline instruction).

7. Developers of distance learning courses: A variety of sources (university personnel, consortia, commercial producers) develop distance learning course material; few states indicate that classroom teachers participate in the development process.

8. State department accreditation: Distance learning has had no direct impact on state department accreditation.

9. Administrative uses of audio, video, or computer telecommunications: Virtually all respondents noted that school districts use computers extensively for administrative, management, and record-keeping purposes with some use of computer networking and audio teleconferencing.

10. State department of education planning for the impact of distance learning: Planning appears to be in the committee or task force stage, with only one state department of education indicating a long-range strategic plan for the implementation of distance learning in the future.

Following her summary of the survey, Dr. Downing discussed its implications for state education policymaking. Implications of the "Survey on Uses of Distance Learning," according to Dr. Downing, vary. One implication is the importance of the state departments of education taking a major leadership role in the planning, implementation and maintenance of distance learning delivery systems. A second implication is the critical leadership of state departments in addressing the state funding sources for these systems. Finally, the issues of teacher certification, state

accreditation, and strategic, long-term planning must be explored now by educational decisionmakers in order to assure quality distance learning in the future.

PART V: THE FUTURE

The Regional Forum on Distance Learning culminated in the session titled "The Future" in which the educational leaders in the six states and at the federal level addressed the participants. Preston Kronkosky, Executive Director of the Southwest Educational Development Laboratory, welcomed the participants to this final session by recognizing the support of the Department of Education and the National Institute of Education. He further expressed pleasure with the efforts of the six state departments of education and AT&T Information Systems.

Dr. Kronkosky then introduced the Host of the session, Leonard De Layo, Superintendent of Public Instruction in New Mexico. Mr. De Layo in turn introduced the chief state school officers, or their representatives, of the region -- "those responsible for leading their states toward the implementation of appropriate uses of technology in education." These were Don Roberts, Director of Instruction, Arkansas; D. G. Joseph, Deputy Superintendent, Louisiana; Charles Holladay, Superintendent, Mississippi; Jack Strahorn, Assistant Superintendent, Oklahoma; and Grace Grimes, Deputy Superintendent, Texas. Each chief or his designate greeted the Forum and spoke to the importance of technology in the state.

Mr. De Layo then introduced Dr. Manuel Justiz, Director of the National Institute of Education, who read a statement from Secretary of Education Terrel H. Bell. Thereafter, Dr. Justiz addressed the Forum. Their statements follow.

Dr. Kronkosky closed the Forum by expressing his honor at Dr. Justiz' participation. He further conveyed his pleasure at being able to further the particular goals of the Department of Education and of the National

Institute of Education of cooperating with the private sector and of enhancing state education agencies' abilities to reach excellence while maintaining cost efficiency. Finally, as Director, Dr. Kronkosky thanked the many contributors who helped ensure that the Forum reached it goals.

Remarks by Dr. Terrel H. Bell
Secretary, Department of Education
Delivered by Dr. Manuel Justiz

As Secretary of the Department of Education, I commend the Chief State School Officers and the State Education Agencies in Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma and Texas, and the Southwest Educational Development Laboratory for sponsoring the Regional Forum on Distance Learning. The Department supports activities such as this Forum because it

- encourages cooperation among education agencies;
- encourages cooperation between public agencies and the private sector; and,
- focuses on educational technology as a means toward raising standards of achievement in the New Basics without expanding school budgets.

The National Commission on Excellence in Education proposed that high school graduation requirements be strengthened, that schools consider a lengthened school day or school year, and that schools, colleges and universities raise their expectations of student's achievements.

The implementation of these recommendations can be costly. The alternative means for delivering instruction that this Forum illustrates are worthy of consideration by all state education agencies as they seek to resolve the problems posed by rising costs and rising expectations.

The final recommendation proposed by the Commission urges educators and elected officials to take responsibility for providing the leadership necessary to achieve the Commission's reforms. I am heartened, therefore, by the leadership evidenced by you and your agencies in working together and in working with the private corporations that assisted in this Forum.

The Department plans to continue its work with Congress and particularly with the states and the localities to emphasize educational uses of technology. I am gratified by the cooperation and commitment to this goal that is shared by the agencies that produced this Forum.

Remarks by Dr. Manuel Justiz
Director
The National Institute of Education

This afternoon's program has demonstrated the marvelous potential that technology holds for improving American education. The fact that I can address you from my office here in Washington more than a thousand miles away is evidence of some of the remarkable possibilities that exist for our schools.

Today you have been able to hear voices from several different states as clearly as though the speaker were in front of you. Indeed, the potential for improving education through technology is as vast as our imagination is broad. Perhaps soon, similar forms of technology will be applied in the classroom. We will probably be seeing students simultaneously attending classes in states hundreds of miles away. Through a telephone line or a communication satellite, a professor will be able to offer the same instruction as if he were in the same state or the same classroom presenting the same lecture.

Already, in Alaska, students are benefiting from technology of this type. Thanks to a communication satellite and lots of ingenuity, every school district in the state of Alaska is now hooked up to a central computer. This means that students in a remote village two hundred miles above the Arctic Circle can now have the same access to educational information as students in much larger areas such as Anchorage and Fairbanks. Eight full-year courses, including math and science, are being offered to students in every section of Alaska due to technology.

In Appalachia, technology has also benefited education. Just as in Alaska, there were problems in remote, low-income school districts which were preventing students from progressing as fast as their counterparts in more affluent sections. To confront this, a satellite television system was established to deliver educational programming to even the most remote schools in the Appalachian region. This application of technology has since grown to the point that the system is now transmitting 64 hours a week of educational programming to cable television systems across this country. It can now be received by more than four million homes in 48 states. Today the system is known as a "learning channel." Experiences in Alaska and Appalachia are strong evidence that educational technology can profoundly impact education. At the National Institute of Education, we are attempting to continue this progress.

One of our top priorities this year is exploring how education can be improved by technology. Last September we took a giant step in that direction by establishing the Educational Technology Center at Harvard University. This Center will serve as the government's primary facility for determining how applications of technology can enhance student achievement.

One of the areas the Center will be examining is how computers can be best used in the classroom. As many of you know, computers are being purchased for schools at rapid and increasing rates. In fact, in the last count, at the end of November 1983, we learned that over 300,000 computers had been purchased and are being used in classrooms throughout the country. Yet, the effects to date of a student's learning have been minimal. One of the most significant barriers is the lack of high quality instructional software. If computers are to realize even part of their potential for improving learning, it is essential that software be dramatically improved. This will be one of the biggest challenges and one of the main efforts of the new Educational Technology Center at Harvard University. This Center will be examining other applications of technology as well. For instance, it is possible that video games like Pac-Man and Time Wars be adapted in such a way to teach the principles of science, math and other subjects.

A growing potential is the use of computers to simulate situations which cannot be observed in real life. Take geology classes; you can't sit around and watch coal develop; yet, through simulations on the computer screen, students will be able to compress a million years into just 20 minutes. They will be able to watch the evolution of coal beginning with the jungle swamp. They will be able to see plants and leaves decompose as layers and layers of vegetation cover the old decayed material. Computers will be able to take students inside a nuclear reactor. There they will be able to observe the effect that radioactive control rods have on nuclear buildup as they are inserted or withdrawn from the pile.

Computers will also enhance safety in laboratories. For instance, in chemistry classes, students will be able to determine what effect mixing

certain chemicals will have without actually combining the dangerous substances. All these areas will be of great interest to the researchers at the Educational Technology Center.

Yes, technology offers unlimited opportunities in education. I want to echo Secretary Bell's remarks in commending you for your interest in this very exciting and important area.

As you know, the examples I have mentioned can only be realized with your support, your enthusiasm and your full commitment. It is imperative that our political leaders in Congress and in state legislatures across the country be kept aware of the marvelous potential that technology holds for improving American education. It is equally important that the private sector can be shown how it can benefit, as well, from these technological applications in the classroom. Business will be an important partner in this effort, and they will be important in helping us prepare our young people to compete most effectively for the opportunities of the world of tomorrow.

So as you leave this afternoon, please think about how you can help spread the word about the wonderful opportunities we are facing in the world of education today through technology. I believe it will pay off, not only for the students of today but also for the generations to come in the future.

Again, I would like to commend you on a very exciting and a very creative program. We are very pleased to be a part of this important activity that the state departments of education and the Laboratory have undertaken, and we congratulate you for an outstanding program and a very, very exciting venture.

PART VI. REPORT ON AN EXPERIENCE IN DISTANCE LEARNING

The Forum itself was an experiment in distance learning. For this reason, we would like to share with readers of this report our findings -- a synopsis describing the Forum's preparation, behavioral and technical successes and problems encountered during the Forum, and our suggestions for what to do the next time a project of this magnitude is undertaken. Behavioral observations were noted at the Austin site; it is assumed that they could generalized to the entire group.

Behavioral observations. The need for silence in the teleconference room forced attendees to listen. Observation of those participating in the Forum at the Austin site showed that good listening behavior (evidenced by nods, smiles, and at times even sitting upon the edge of chairs!) tended to decrease (1) as the session progressed and (2) as the day progressed.

Perhaps it was this intense listening that made the attendees generally intolerant of redundant questions. Unquestionably, the one or two questions which seemed to be repeated, while handled quite amicably by the presenters, were not appreciated by attendees (evidenced by shaking of heads, rolling of eyes). Along the same lines, attendees did not seem to enjoy extended small talk (i.e., too many specific hellos by individuals to people at other sites).

The very nature of the teleconference seemed to promote congeniality. Nonverbal cues were difficult to establish; attendees seemed to know that their tone of voice was important. Along the same lines, humor was always welcome -- the pun or joke gave attendees an opportunity to react (participate) and to be an active part of the group (evidenced by increased eye contact with others in the room).

Effective listening behaviors also seemed to improve when sites interacted. The opportunity for questions and comments appeared welcome by participants. Also, the group seemed to show heightened interest when dual presenters actually discussed issues between themselves and when participants at remote sites talked directly with one another, not just "through" the presenter.

As any conference attendee knows, the crowd attending certain sessions seems to swell during certain presentations and shrink for others. This "in and out" practice posed no problem for this particular teleconference, as long as the site which connected or disconnected made that general announcement to the group. Only at one point in the program did a site disconnect without notifying the operator and the other sites. When the non-present site was addressed, the silence resulted in confusion; the facilitator was unsure whether the problem was poor transmission or whether the addressed site was "out to lunch."

Technical observations. For the most part, the technical problems encountered by the Forum were minimal. Forum organizers in Austin experimented with the use of three different bridge companies: ConferTech, Kellogg, and Darome. Unquestionably, Darome gave the best service in terms of the operator's handling of meetings and clear transmissions. As an example of one transmission problem, Gerlovich and Unruh, who spoke from a hotel room in Boston where they were attending a conference, had transmission problems using the hard-wired telephone they used. The first solution to the poor transmission was for the session host to ask the presenters to speak up; they did so with little success. Finally, the operator offered a solution: "Give the phone a thump against the table!" Conferees heard the thump and then were delighted to hear a very clear connection. One

participant at the Austin site called the process a "higher level of problem solving!"

The other major technical problem encountered was the inability of New Mexico to receive Gemini Blackboard transmissions. While this problem was thought to be resolved after the first day, the situation continued throughout the conference. (A related equipment problem was experienced by Mississippi which did not have access to the Gemini Blackboard.)

In addition to this Austin-based response, the Forum planners commissioned an independent consultant, David Gillmore, to conduct a telephone survey of participants, site coordinators and consultants. Recommendations for future distance learning activities include (1) incorporating a visual component along with the audio; (2) staff visits to participating sites to help insure adequacy of facilities and equipment arrangements; and (3) focusing on a specific technology on which intensive training is provided.

The overall effectiveness or impact of the Forum was addressed by two questions in the telephone interviews. In response to the question "Do you plan to implement any of the ideas presented at the Forum?", 58% of the persons interviewed indicated that they would in the near future implement some form of distance learning in their state. The forms of distance learning cited by the states include a similar forum for internal staff development and setting up distance learning in several rural areas of the state. Further, in response to the question, "Will the Forum content be of use to you in making decisions about the implementation of distance learning?," 95% of the respondents replied "Yes." Comments from the respondents on this question revealed that even though implementation may be several years away, the information presented combined with the notebook of resources will definitely be used as the states start implementing distance learning.

The evaluation concluded, "it is evident that the Forum accomplished its goals and objectives."

PART VII: RESOURCE INFORMATION
The Consultants

Many institutions and individuals contributed their time and expertise toward planning and conducting the Regional Forum on Distance Learning. In keeping with this Report's objective to serve as a resource to educators interested in investigating distance learning, these institutions and people are listed below with contact information.

In addition to the following resources, the Southwest Educational Development Laboratory commissioned two papers, conducted a nationwide survey, and prepared a Trial-Run manual and a Participant's Notebook for the Forum. The papers are "Issues of Law and Policy Affecting Telecommunications-Based Distance Learning," by Michael Goldstein, and "Distance Learning: A Review for Educators," by Heather Hudson. These papers, the "Survey on Uses of Distance Learning in the U.S.," the "Trial-run Practice Session Information," which provides logistical assistance, and the "Participant's Notebook," which contains session handout materials, can be ordered from SEDL.

Names, addresses, and telephone numbers of presenters follow their biographical sketches. For the reader who is interested in more specific information on teleconferencing companies and cost, Dr. Ricklann Bronstein has provided a listing which concludes Part VII.

Louis Bransford is responsible for the management of ConferTech's Washington, D.C. Office. He has researched and written widely in the area of communications; recent articles include "The Information Poor in Transition: The Effect of Telecommunications," and "Delivery of Instructional Materials Using a Communications Satellite."

Rickiann Bronstein, primary author of Teleconferencing: - A Practical Guide to Teaching by Telephone, holds a master's degree in medical technology from Virginia Commonwealth University and a Ph.D. in Instructional Design from the University of Colorado. She has been the Instructional Development Consultant at the University of Colorado Health Sciences since 1977.

Elliott Duchon is responsible for operations of the TEC Center related to computers and educational technology. He has served as an elementary classroom teacher in Jurupa Unified School District and as a private consultant working on the Long-Range Facility Plan for Riverside County Schools.

Ron Fortune is responsible for marketing for Computer Curriculum Corporation.

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Clarice Kenney is Supervisor of Elementary Schools in Caldwell Parish, a very small, very rural school system in Louisiana. A reading specialist, she has taught for 15 years.

William Kirby has been involved with the Texas Education Agency since 1965 where he is currently Deputy Commissioner for Finance and Program Administration. He holds a Ph.D. in Reading, Early Childhood Education, and Administration from the University of Texas.

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Fred McCormick is President, Educational Operations Concepts, Inc. He has developed and implemented a number of unique techniques in research, evaluation, and assessment. He has served as a coordinator, researcher, and administrator at various institutions and organizations including the University of Minnesota and the Boy Scouts of America.

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Mary E. Payer is a Consultant in Computer and Communications Technologies. She has served agencies including the Office of Technology Assessment and the National Center for Education Statistics. She is co-author of Status Report on the Use of Technology in Education, 1981. Ms. Payer is currently completing her Ph.D. at Columbia University.

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Paul Resta is Chief of Research, Planning, and Technology in the Office of the Director of the National Institute of Education. Dr. Resta is currently on leave from the University of New Mexico where he is Professor of Education and Associate Dean for Research. He has directed research on computer applications in education.

Margaret Riel works with computers in classrooms; currently, she is involved in a research project in which she is examining the effects of computer use on classroom organization, teaching and learning strategies, and student achievement. She has a Ph.D. in Social Sciences from the University of California, Irvine.

Betty J. Scott has been an instructor in the Dallas Independent School District for 22 years. At South Oak Cliff High School, she is a mathematics instructor, department chairperson, and director of "Project Gemini" -- an educational program utilizing the Electronic Blackboard. Mrs. Scott received an "Excellent Teacher" award in 1982.

Frederick D. Todd, Sr. has been Principal of South Oak Cliff High School (Texas) since 1975. Among his honors are Principal of the Year, Subdistrict II, Dallas Independent School District, 1982.

Roy Unruh is currently Associate Professor of Physics and Science Education at the University of Northern Iowa. He has directed seven National Science Foundation implementation programs in Iowa for programs such as Project Physics, Elementary Science Study, and Intermediate Science Curriculum Study.

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SOME PROVIDERS OF TELEPHONE CONFERENCING EQUIPMENT *

Company	Equipment Price Range*
Darome, Inc. 711 E. Diggins Harvard, Illinois 60033 (800) 435-6174	$ 500-$1,300
Northern Telecom, Inc. 640 Massman Drive Nashville, Tennessee 37210 (615) 883-9220	$ 160-$1,000
Precision Components, Inc. 110 W. National Avenue Addison, Illinois 60101 (312) 543-6400	$ 250-$1,300
Shure Brothers, Inc. 222 Hartrey Avenue Evanston, Illinois 60204 (312) 866-2440	N/A
Teletek Sound Systems 41 Martin Lane Elk Grove Village, Illinois 60007	$ 2,500
Westell, Inc. (CONTECH) 7630 Quincy Street Willowbrook, Illinois 60521 (312) 789-0888	$ 300-$1,700
Local Telephone Company	Monthly Rental $ 11- $ 60
Local Radio Shack Other Electronic and Telephone Equipment Distributors	N/A

*Based on 1982 Information

10/28/83

*Rickiann Bronstein